JPRS-UCH-87-001

6 FEBRUARY 1987

USSR Report

CHEMISTRY

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service (NTIS), Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semimonthly by the NTIS, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS-UCH-87-001

6 FEBRUARY 1987

USSR REPORT

CHEMISTRY

CONTENTS

CATALYSIS

CHEMICAL INDUSTRY

RADIATION CHEMISTRY

WATER TREATMENT

WOOD CHEMISTRY

ADSORPTION

UDC 66.074.3

CHARCOAL ADSORPTION METHOD OF DECONTAMINATING GAS EMISSIONS TO REMOVE ORGANIC TIN COMPOUNDS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 8, Aug 86 (manuscript received 28 Dec 84) pp 1706-1708

[Article by A. S. Stepanov and G. N. Batrakov]

[Abstract] Studies were performed on the adsorption of organic tin compounds on active charcoal at 25°C under dynamic conditions using artificial vapor-air mixtures at a flow speed of 0.2 m/s in a 20 mm diameter adsorber with tetraethyl tin and tetrabutyl tin adsorbate. Regeneration of the activated charcoal by water vapor was studied at 120 to 300°C, heating time 1-2 hours, steam consumption 5-7 Kg/Kg adsorbate extracted. The laboratory studies were used as the basis for design of an experimental installation consisting of an adsorber and 300°C steam regenerator. The installation was tested on catalyst production waste gases containing organic tin compounds plus volatile organic solvents. The degree of purification of the gas did not decrease over 2-3 adsorption - regeneration cycles. Figures 2; references 12 (Russian).

6508/9716
CSO: 1841/13

UDC 541.183:541.18:532.135

EFFECTS OF HYDROPHOBIC INTERACTIONS ON REDUCTION OF HYDRODYNAMIC FRICTION IN SURFACTANT SOLUTIONS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 60, No 8, Aug 86 (manuscript received 19 Nov 84) pp 1985-1989

[Article by G.G. Starobinets, Minsk Radiotechnical Institute]

[Abstract] Mathematical considerations are applied to the hydromechanical and electrical factors affecting friction in surfactant solutions, leading to the demonstration that hydrophobic interactions result in reduction of hydrodynamic friction. The discussion involves demonstration of the formation of cavities in the aqueous solvent systems that accommodate the surfactant, orientation of the lyophilic and lyophobic portions of the surfactant within the

cavity, and coalescence of the cavities as a result of hydrophobic interactions. As a result of coalescence, the surface tension of the enlarged cavity decreases due to the increase in its radius and the increase in the concentration of the enclosed hydrophobic radicals. In this sense, the surface tension at the air-water interface is that applicable to a 'cavity' with a very large radius, while the concentration of surfactants at the surface may be represented as coalescence of a number of small cavities with a very large one. Analysis of the equation relating the dipole moment of such cavities to dielectric permeability demonstrates that the reduction in hydrodynamic friction is favored by high surface activity of the dissolved substance, large surface area of the cavities, large dielectric constants of the solvent, and low dipole moments of the solute cavities. References 13: 9 Russian, 4 Western.

12172/9716
CSO: 1840/21

UDC 541.183:547.979.7

ASSOCIATION OF CHLOROPHYLL A AND ITS DERIVATIVES WITH CHOLESTEROL ON NONPOLAR SURFACES

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 60, No 8, Aug 86 (manuscript received 11 Jun 85) pp 2042-2045

[Article by T.N. Kropacheva, N.A. Mamleyeva and L.I. Nekrasov, Chemical Faculty, Moscow State University imeni M.V. Lomonosov]

[Abstract] In order to study the effects of cholesterol on the nature of chlorophyll-a aggregates, and of its analogs (pheophytin-a and pheophorbid-a) the diffuse reflection and fluorescence spectra of the pigments alone and in combination with cholesterol were evaluated when adsorbed to silochrome with chemically coupled hexadecylsilyl radicals (C-16). The silica adsorption studies demonstrated that pigment-cholesterol associations are formed at the expense of pigment aggregates. The fluorescence yield was predicated on the molar ratio of cholesterol and a given pigment in the adsorbed layer. Formation of chlorophyll:cholesterol complexes with 1:2 or 1:1 molar ratios leads to an increase in the monomeric chlorophyll fraction and, accordingly, enhanced fluorescence. Deaggregation of chlorophyll-a and its analogs presumably involves encapsulation of some of the pigment molecules within a cholesterol 'membrane', with others escaping encapsulation. The data were interpreted to represent the fact that the nonpolar C-16 surface facilitates the formation of a cholesterol matrix capable of incorporating high concentrations of chlorophyll-a and its analogs. Figures 3; references 13: 8 Russian, 5 Western.

12172/9716
CSO: 1841/21

ANALYTICAL CHEMISTRY

SYMPOSIUM ON COMPREHENSIVE ENVIRONMENT-MONITORING METHODS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 23 Nov 86 p 1

[Excerpt] An international symposium, "Comprehensive Methods for Monitoring the Quality of the Natural Environment", will open tomorrow in Moscow. A. Ovchinnikov, corresponding member of the USSR Academy of Sciences and chairman of the symposium's organizing committee, told about the tasks of the upcoming forum, at the request of our correspondent:

"The main task is defined by the symposium's title: comprehensive methods and approaches are what is now needed for evaluating the condition of the environment objectively. Specialists in our country and abroad who are studying harmful effects of human activity on forests, bodies of water, the atmosphere, and soil (so-called anthropogenic abnormalities) have amassed a wealth of experience and developed original monitoring methods and equipment. The symposium should help to publicize them on a broad scale.

"Systems analysis of the quality of the environment has begun to advance. Academician K. Kondrat'yev laid the scientific groundwork for this. Too few people know about the latest achievements of laser probing, and of space monitoring of the Earth's surface. Diagnosis with the aid of biological objects is yielding interesting results. Living sensing devices are becoming more and more numerous. Marine plants, mollusks and plankton remove harmful impurities from sea water. And mosses have been found to react sensitively to air pollution. Changes occur in their cells, and their genetic apparatus readjusts. Scientists are observing such mutations closely, and a special direction has even appeared. It is apparent that the time has come to combine the most advanced methods of monitoring into a single diagnostic system and to develop mobile laboratories with diverse instrumentation.

"The effectiveness of research by biologists, medical personnel and botanists depends directly upon progress in the field of chemical physics. [At the symposium] we wish to acquaint ecologists with a new scientific direction--electronics of organic materials. A variety of sensing devices based on organic semiconductors will raise monitoring to a new level and make it more accurate and adaptable. After all, these devices possess the unique property of sharply altering their characteristics in response to the presence of even microscopic doses of certain substances. Polymers send out electric signals which are then fed easily into a computer and processed. And it is possible in principle to synthesize polymers that will detect any impurities in the air."

/9716
CSO: 1841/50

UDC 547.541.47

PREPARATION OF CHIRAL PROSTAGLANDIN SYNTHONS BY ENZYMATIC HYDROLYSIS OF RACEMIC 2-ENDO,6-ENDO-DIACETOXY-CIS-BICYCLO-[3.3.0]-OCTANE BY CORAL (PLEXAURA HOMOMALLA) TISSUE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 9, Sep 86 (manuscript received 9 Oct 85) pp 2143-2156

[Article by M.A. Dyadchenko, V.I. Melnikova and K.K. Pivnitskiy, Institute of Experimental Endocrinology and Hormone Chemistry, USSR Academy of Medical Sciences, Moscow]

[Abstract] Coral (Plexaura homomalla) tissues were employed as a source of esterase for the deracemization of 2-endo,6-endo-diacetoxy-cis-bicyclo-[3.3.0]-octane (I) under heterogenous conditions. The reaction yielded [(+)-I] and [(-)-I] with respective yields of 15 and 45% and ca. 88% enantiomer excess. An equivalent results was obtained with the enantioselective hydrolysis of 2-endo-acetoxy-cis-bicyclo-[3.3.0]-oct-6-ene. The enantioselective hydrolysis approach was used to synthesize the chiral synthon (1R,2S,5S-bicyclo-[3.3.0]-oct-6-en-2-ol. These observations demonstrate that P. homomalla may be used to produce chiral prostaglandins via two pathways: 1) as a source of (15R) - and (15S)-prostaglandins A_2, and 2) as an enzyme source for the preparation of chiral prostaglandin synthons. References 24: 5 Russian, 19 Western.

12172/9716
CSO: 1840/29

UDC 66.097.3:539.211:543.423

SURFACE COMPOSITION OF INDUSTRIAL CATALYSTS FOR AMMONIA SYNTHESIS

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNOLOGIYA in Russian Vol 29, No 6, Jun 86 (manuscript received 17 Jan 1985) pp 56-58

[Article by M. G. Chudinov, V. M. Perov, A. M. Alekseyev and V. I. Ksenzenko, Department of Inorganic Materials and General Chemical Technology, All-Union Correspondence Polytechnic Institute]

[Abstract] Catalyst CA-1 for ammonia synthesis was studied to determine the surface composition of the catalyst in its oxidized, reduced and passivated states with X-ray photoelectronic spectroscopy. Reduction was carried out at 98 kPa at 20-550°C for 5 hrs. Samples were then passivated with 1.5% oxygen in helium at 50°C for one hr. The bulk % composition of the oxidized CA-1 was 39.03 Fe, 0.59 K, 2.36 Al, 1.41 Ca, 0.21 Si. 56.37 O, 0.003 S, 0.032 Cu. The developed method for quantitative analysis of the surface showed that during reduction the relative content of O and K on the catalyst surface decreased to .67-.5 while the relative content of Fe, Ca, and Si was 1.5-4 times as much. Comparing the surface composition of the oxidized catalyst with the bulk composition, it was apparent that the catalyst surface was enriched with the promoters K, Al, Ca, and Si, but depleted of Fe. All Fe (12.18-13.11%) on the surface of the reduced catalyst was in the metallic state. Cl, N, Mg and Na were found on the catalyst surface and their total relative content on the surface increased during catalyst reduction from 1.08-2.28% to 3.64-4.71%. Surface composition of the passivated catalyst is close to that of the reduced catalyst. The data agree well with earlier work and can be used to create new catalysts with greater activity because of increased Fe on the catalyst surface. References 9: 5 Western, 4 Russian.

12886/9716
CSO: 1841/5

UDC 678.8+542.973.8

COMPOSITION OF DEPOSITS FOR OXIDE CATALYSTS IN PYROLYSIS PROCESS

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNOLOGIYA in Russian Vol 29, No 6, Jun 86 (manuscript received 21 Feb 1985) pp 59-61

[Article by R. B. Valitov, R. S. Sarmanayev, R. M. Usmanov and R. R. Khabibullin. Department of General and Analytical Chemistry, Ufa Petroleum Institute]

[Abstract] High temperature catalysis of an 85-185°C gasoline fraction on an iron-chromium-potassium oxide catalyst in the presence of nitrogen, hydrogen and hydrogen-plus-steam was studied to determine the composition of the deposits on the oxide catalysts and the effect of the added agents on the nature of these deposits. Pyrolysis of gasoline with N_2, H_2 and H_2-plus-steam showed that when the time was prolonged from 0.5 to 5 hrs. the coking capacity increased in all cases but to a different degree. The products of condensation on the catalyst surface increased rapidly with time and the most for N_2, coke deposit was much lower for H_2 and the coking capacity for H_2-plus-steam was very much less. The composition of the deposited condensation products for H_2 addition, expressed as H to C ratio, was 0.390 and 0.405 for 0.5 and 4 hrs.; for H_2-plus-steam, 0.386 and 0.058; for N_2, 0.410 and 0.005. The low values indicate dehydrogenation and H_2 depletion. The addition of H_2 to the raw material led to comparatively low yields (0.1% at 4 hr. reaction time) of oils, neutral tars and asphaltenes; carbenes-carboids were reduced and carbon compounds were increased as time was prolonged. The results for H_2-plus-steam were analogous but not as good. For N_2 addition, the results were least attractive. The data confirm the improvement in catalyst regeneration when the deposits of oil, neutral tars and asphaltenes are enriched with H_2. References: 2 Russian.

12886/9716
CSO: 1841/5

UDC 541.128.3:541.6:542.944'947:547.412.733:546.39

ALKALINE DEHYDROCHLORINATION OF PENTACHLOROPROPANE. PART 3. STRUCTURE-CATALYTIC ACTIVITY CHARACTERISTICS OF QUATERNARY AMMONIUM BASES (QAB) IN DEHYDROCHLORINATION OF 1,1,2,2,3-PENTACHLOROPROPANE (PCP)

Moscow KINETIKA I KATALIZ in Russian Vol 26, No 6, Nov-Dec 85 (manuscript received 15 Aug 83) pp 1478-1481

[Article by F.S. Sirovskiy, S.M. Velichko, Yu.A. Treger, A.L. Chimishkyan and M.V. Panova]

[Abstract] A study was conducted on the structure-activity relationships of 14 QABs with respect to catalytic dehydrochlorination of PCP at 293 K and 6.12 M NaOH in the aqueous phase. The study demonstrated that the activity

may be depicted by a parabolic function with the use of QABs with average logP values involves transition of the cation from the aqueous phase to the lipid phase as a prerequisite for catalytic activity. References 8: 4 Russian, 4 Western.

12172/9716
CSO: 1841/401

UDC 541.128.3:542.945.27:547.912:546.621'73'77:665.658.86

EFFECT OF PRESSURE ON DEMETALLIZING EFFICIENCY OF Al-Co-Mo CATALYSTS IN HYDROFINING OF HEAVY CRUDE OIL

Moscow KINETIKA I KATALIZ in Russian Vol 26, No 6, Nov-Dec 85 (manuscript received 31 Jan 85) pp 1497-1499

[Article by M.A. Lurye, L.P. Milova, V.N. Krotova, L.N. Vetlugina and N.M. Zaydman, Institute of Oil and Petrochemical Synthesis, Irkutsk; Institute of Catalysis, Siberian Department, USSR Academy of Sciences, Novosibirsk]

[Abstract] Various Al-Co-Mo catalysts were tested for their efficiency in the removal of Ni and V from heavy Western Siberian crude oil at 380°C and pressures of 5-10 MPa. Hydrofining studies on crude containing 50 mg/kg of Ni and V demonstrated that catalysts with 0.09 cm^3/g of > 100 nm radius pores showed a reduction in efficiency of Ni and V removal as the pressure dropped. However, catalysts with a pore concentration of 0.2-0.3 cm^3/g showed no change in the efficiency of V elimination with a decrease in pressure (although efficiency with respect to Ni removal decreased). Throughout, catalysts with 0.2-0.3 cm^3/g pore volume were more efficient in promoting metal deposition than the 0.09 cm^3/g catalyst with equivalent pore size (>100 nm radii). Figures 1; references 10: 1 Polish, 4 Russian, 5 Western.

12172/9716
CSO: 1841/421

UDC 631.841.85

APPLICATION OF ADAPTIVE CANONICAL MODEL TO RAW MATERIAL LOSS IN NEUTRALIZATION PROCESS CONTROL

Kiev KHIMICHESKAYA TEKHNOLOGIYA in Russian No 5, Sep-Oct 86 (manuscript received 8 Aug 85) pp 55-59

[Article by T.S. Gosh, Kiev Polytechnic Institute]

[Abstract] A mathematical analysis was conducted on the loss of ammonia, nitric acid and ammonium nitrate in the process of nitric acid neutralization by ammonia in ITN reactors. Detailed description is provided of an adaptive canonical model for the loss, that makes possible the reduction of adjustable parameters from (n-1)n/2+2n+1 to n+1, where n is the model dimensionality.

The implementation of a control system relying on the canonical model at the Cherepovets "Ammofos" plant was cost effective to the order of 100,000 rubles per annum. Figures 3; references 4 (Russian).

12172/9716
CSO: 1841/25

UDC 66.06.03

ACHIEVEMENTS OF ALL-UNION CHEMICAL SOCIETY IMENI D.I. MENDELEYEV IN UKRAINE IN 11th FIVE YEAR PLAN AND FUTURE TRENDS IN LIGHT OF DECISIONS OF 27th CPSU CONGRESS

Kiev KHIMICHESKAYA TEKHNOLOGIYA in Russian No 5, Sep-Oct 86 (manuscript received 25 Mar 86) pp 65-67

[Article by I.I. Prokopenko, Ukrainian Republic Administration, All-Union Chemical Society imeni D.I. Mendeleyev]

[Abstract] In the 11th Five Year Plan the various local chapters and organizations of the Ukrainian Administration of the All-Union Chemical Society conducted an extensive public information campaign, in conjunction with an expansion of its organization network in Ukraine. The Society was active in rendering consultation to various industrial and agricultural organizations, and promoted bioconversion of agricultural wastes. Through the efforts of the Society, chemical productivity showed a marked increase, and intensive measures were undertaken to insure that the various programs for economic and industrial development of the USSR are meeting with full success. The variety of programs sponsored by the Society include postgraduate training, development of new technology and its implementation, and efforts to increase the practical contributions of research institutes to national needs. The Society will contribute to strive for the success of the 12th Five Year Plan through further emphasis on innovations and research, higher quality control standards, flexibility in meeting practical goals, and by enhancing public appreciation of scientific and engineering endeavors.

12172/9716
CSO: 1841/25

UDC 6.094.373.537.531

STUDY OF SULFURIC ACID VANADIUM CATALYSTS TYPE SVS, SVD AND KS BY X-RAY PHOTOELECTRON SPECTROSCOPY

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 8, Aug 86 (manuscript received 30 Jul 85) pp 1858-1860

[Article by A. I. Minyayev, I.A. Denisov, V. Ye. Soroko and Yu. N. Lukin, Leningrad Institute of Technology imeni Lensovet]

[Abstract] Unused and spent type SVD, SVS and KS catalysts were studied by x-ray photoelectron spectroscopy. Comparison of the vanadium bond energy

in the catalysts studied with the standard value indicated that it increases by an average of 0.5 eV in KS and SVS catalysts, 1.0 eV in SVD catalysts after synthesis. The electron bond energy was also elevated in comparison to the standard values. The data indicate the presence of vanadium sulfate alkali metal complexes in the catalysts. The x-ray photoelectron spectra of the three catalysts were found to be identical after use. The reaction medium therefore creates a catalytically active substance similar in chemical composition in all three cases. Interaction between the catalytically-active substance and the carrier in these vanadium catalysts may be related to electron density transfer from the vanadium to the carrier, which is indicated by the increase in bond energy. References 6: 4 Russian, 2 Western.

6508/9716
CSO: 1841/13

UDC 66.094.373.537.531

INFLUENCE OF REACTION MEDIUM ON VANADIUM SULFATE CATALYSTS SVD, SVS AND KS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 8, Aug 86 (manuscript received 30 Jul 85) pp 1860-1862

[Article by A.I. Minyaev, I.A. Denisov, V.Ye. Soroko and V. Ya. Yegorov, Leningrad Institute of Technology imeni Lensovet]

[Abstract] The vanadium sulfate catalysts SVD, SVS and KS were studied before and after testing in a contact catalystic apparatus. SVD and SVS catalysts were utilized in the first layer of the apparatus at 820 K, 10 months, KS was used in a fluidized bed at about 800 K, 1.5 months. Chemical analysis was performed by oxidometry. X-ray photoelectron spectra were recorded with Al K_{α} radiation, energy resolution 1.8 eV. It was found that the individual chemical compositions of the surface layers of the synthesized catalysts were different. Concentration gradients of potassium and vanadium ions were found through the depth of the catalytically-active film. The reaction medium was thus found to form a surface layer composition with a molar K_2O/V_2O_5 ratio of 8.5-9.0. References 5 (Russian).

6508/9716
CSO: 1841/13

USSR PRODUCTION OF ULTRAPURE SUBSTANCES AND FINE CHEMICALS

Moscow KHIMIYA I ZHIZN in Russian No 8, Aug 86, pp 5-9

[Interview of Deputy Minister of the USSR Chemical Industry S. V. Golubkov by L. I. Levina (time and place not given) under the "Resources" rubric: "Catalyst of Catalysts"; quotation at head of article and first paragraph published in boldface]

[Text] "...To increase the output and expand the range of small-tonnage chemical production, most of all the production of fine organic synthesis..." Basic Directions of the Economic and Social Development of the USSR for 1986-1990 and for the Period up to the Year 2000.

Deputy Director of the USSR Chemical Industry S. V. Golubkov at the request of the editorial staff tells about the development of small-tonnage chemistry in the USSR and about the tasks which are set for the chemical reagent and ultrapure substances industry.

Mainline technical directions appear at each step of the development of engineering which determine the character of its time to which the prospects for the development of the economics and the material basis of human civilization are related. Today, thermonuclear power engineering, electronics, optics, laser engineering, and biotechnology are in the first rank. Their development is impossible without improved microelectronics, computers, instrument making, and the information industry, without those sectors which are called correctly the catalysts of technical progress. And they, in their turn, cannot be developed without the newest materials, innumerable chemical reagents, and pure and ultrapure substances. Basically, these are catalysts of catalysts--they determine the development and the technical progress of the most advanced fields of science and engineering.

Let us recall the recent past--first-generation electronics, which was based on electrovacuum tubes: cumbersome and power-consuming tube radio receivers and computers carrying out in all several tens of thousands of operations per second. The successes of industrial production of very pure silicon, germanuim, and other semiconductors and the achievements of solid-state physics led to the building of second and subsequent generations of electronic instruments. In the world today, there are numbered about 100,000 types of semiconductor instruments having different purposes. In a single technological

process, an electronic circuit which contains tens of thousands of elements, the dimensions of each of which is several microns, is created on a small-sized sheet of semiconductor material. For example, there are more than 1400 transistors in the integrated microcircuit of an electronic timepiece, and they are mounted on a silicon monocrystal with an active area of 3 mm^2. How would a timepiece look if it were necessary to select an electronic circuit on tubes or even on separate semiconductor transistors?

Both subminiature instruments and microcalculators, which are now available to every student (computer instruction which was begun in the school for its social importance and extent is comparable to the campaign for the elimination of illiteracy in the nineteen twenties)--all this became possible due to advances in chemistry, and more precisely, in small-tonnage chemistry and in the production of pure and ultrapure substances.

There is another, no less successful example in my opinion. All of two decades ago there were quartz glasses which were very transparent to visible light and therefore usable in fiber optics, but the light losses reached hundreds of decibels per kilometer. This was related to the high impurity content of the glasses. At the beginning of the nineteen seventies, due to the efforts of chemists, the first USSR light conductors were obtained with losses of about 10 db/km, and now reach a level of 1 db/km. Such is the result of the very high purity of the starting materials. Only in the last few years have we organized the production of about two dozen ultrapure substances for fiber optics.

A large-scale industry of chemical reagents and ultrapure substances has been created in the USSR; it is developing at a rapid pace.

Two and a half decades ago, we produced 59,300 tons of reagents with about 4,000 designations. Now their output comprises about 340,000 tons and the product assortment has doubled and exceeds 12,000 designations. Ultrapure substances are produced today at 30 plants of different ministries and departments, three-fourths of which are at the Ministry of the Chemical Industry enterprises.

In the years of the present five-year plan, operating and newly constructed productions of basic raw materials for organic and inorganic reagents for technological purposes have been expanded, and the industrial output of ultrapure chemical substances of practically all classes has been organized. Basically, this enabled the demands of the leading sectors of the national economy for USSR chemical reagents to be met. But nevertheless, in spite of the advances achieved and in spite of the rapid pace of development, our small-tonnage chemistry is not keeping pace with the rapidly growing needs for its production. General Secretary of the CPSU Central Committee M. S. Gorbachev mentioned this at the June, 1985 meeting of the CPSU Central Committee on the problems of the acceleration of scientific and technical progress, "The present boom in small-tonnage chemistry and the production of pure and ultrapure materials, which in many ways determines the level of modern engineering, is growing in the world. Therefore, it is necessary to double and triple our efforts in order not to tolerate a lag."

In the 12th Five-Year Plan, the industry of chemical reagents and pure and ultrapure substances determining the scientific and technical progress of many other sectors and having an enormous economic effect, will be developed at an accelerated pace. A substantial increase is envisaged in the production and expansion of the product assortment of ferrite powders, luminophores, monocrystals and ultrapure substances for microelectronics and fiber optics; complexones and compositions based on them, complex compounds of a definite composition and structure for intensification of petroleum recovery, for washing, inhibition, and modification of surfaces, and for development of biologically active preparations; and biochemical reagents for biocatalytic processes. The sector must introduce a considerable investment in further development of bioorganic chemistry, molecular biology, genetics, and biotechnology.

On the basis of the Complex Program of the Chemization of the USSR National Economy, a program has been formulated for the development of the production of chemical reagents. (Footnote *) (The Complex Program of the Chemization of the National Economy is described in a paper of the USSR Ministry of the Chemical Industry by V. V. Listov, which is published in No 3 of this year.--Ed.) It, like the whole Complex Program, will be fulfilled in two stages.

At the first stage (up to the year 1990), priority is given to the requirements of the electronics, electrical engineering, radio industry, instrument making, and machine building sectors. And naturally, all these sectors are on the leading edges of scientific and technical progress. The first results are already expected this year.

The second stage (up to the year 2000) is the accelerated development of all small-tonnage chemistry. To accomplish it, all sectors of the national economy must be provided completely with ultrapure substances and very fine products with preset properties. By the year 2000, the production of ultrapure substances will increase, their range in comparison to 1985 will double, and biological reagents and preparations will increase by a factor of 3.5. Small-tonnage chemistry must be taught to react with maximum adaptability to the most unexpected requirements not only of industry but also of science--so that not one order for a new substance would remain unfilled.

A reliable raw material base above all must be created to solve these most complex tasks. It was decided to expand operating productions considerably and to develop new capacities for the output of pure technological raw materials--hundreds of thousands of tons of hydrochloric, sulfuric, nitric, and phosphoric acids of reagent purity, pure potassium and sodium hydroxides, barium salts, copper, lead, and nickel salts, and many other products which will be used at specialized plants manufacturing reagents and ultrapure substances. All the conditions will be established at these enterprises for the production of small quantities of very diverse products, including also for direct orders of industry and science.

The obtaining of high-purity substances is a complex and arduous process. And it is more complex, the purer the final product must be.

Chemical distillation, crystallization, adsorption, and several other methods are used for exhaustive purification. In the pursuit of product purity, methods for removal of impurities, which must be eliminated more and more frequently, have to be combined. Several methods of exhaustive purification are used now to obtain substances with an impurity content of 10^{-7}-10^{-8} percent and less, and processes are conducted at low temperatures in apparatus made of extra-inert materials. By means of multi-step processes (molecular distillation, thermal diffusion, zonal fusion, sorption, etc.), theoretically it is possible to obtain reagents containing 10^{-17}-10^{-18} percent of impurities. However, in practice up to now, this is impracticable because of the presence in solutions in which purification is taking place of difficultly soluble substances in the form of submicron-size particles which are incredibly difficult to remove.

Increased demands for the purity of reagents and materials led to the development of mainly new methods of purification and supersensitive methods of analysis. Recently, for example, the technology of the synthesis of multicomponent materials based on the alloying silicon dioxide was established, and film-forming compositions for coating glasses, and ultrapure acids and solvents for microelectronics with a limited content of suspended particles were developed. Work is being conducted on the expansion of the product assortment of ultrapure organometallic compounds. This plasma-chemical technology for obtaining finely-disperse very pure oxides, nitrides, and carbides has been developed. Very fine instruments of laser spectroscopy and the photoelectric spectroscopy of semiconductors have appeared in plant analytical laboratories.

Naturally, new technological and analytical methods which are characteristic for the production of very pure substances increase the labor intensity of these productions and increase the capital investments in instrumentation, which with every year becomes more and more corrosion-resistant, high-precision, and equipped with reliably functioning control and measuring apparatus.

Every year the product assortment of chemical reagents and ultrapure substances is updated approximately by 10 percent. Only in recent years, for example, was the industrial production of macroheterocycles first developed in the USSR; they are compounds of a new class to be used for the separation of rare-earth elements and actinides and as catalysts for the synthesis of high-quality polymers.

For each new production, new technological process, highly efficient apparatus, and highly sensitive analytical control method, there are thorough studies in the field of the purification and analysis of compounds of different classes, and the work for process engineers and designers at more than forty scientific-research, technological, and planning design institutes--of both sector and academic institutions.

Intensive work is being conducted in the USSR in the field of complexones and metal complexonates--polycomplexones, phosphorus-containing and sulfur-containing compounds, derivatives of the aromatic series, and esters of polyaminopolyacetic acids. The work of Soviet chemists in this field has world

priority. Soviet industry produces about two hundred such substances--considerably more than are produced abroad.

These compounds are used against deposition of salts in thermal power engineering and water circulation systems, for cleaning the surfaces of oil and gas extracting equipment, and for collection of harmful industrial wastes. Among complexones there are effective desorbents, etching reagents, and modifiers for semiconductor materials of integrated circuits. Complexones are finding wider and wider use in agriculture as microfertilizers and feed additives for animal husbandry. Difficultly soluble metal complexonates can find use as slowly acting fertilizers.

The problem of the synthesis and organization of production of macrocyclic complexones, or crown-ethers, remained extremely acute until recently for our sector. These are ultrapure compounds which, by possessing high selectivity for certain chemical elements, are capable of transporting them from one medium to another, even through cell membranes. Because of their unique properties, crown-ethers can find very advantageous use in the chemical industry, atomic power engineering, the metallurgy of rare and trace elements, in nature conservation, and in biology, medicine, and agriculture.

Now, we have already synthesized crown-ethers. The Cherkassky chemical reagent plant in close collaboration with the All-Union Chemical Reagents and Ultrapure Chemical Substances Scientific Research Institute (IRYeA) and the UkSSR Academy of Sciences Physical Technical Institute imeni A. V. Bogatskiy developed the production of these substances. Among them is the preparation 15-crown-5, which increases the effectiveness of the use of herbicides, and increases the coefficient of utilization of nutrients by plants by a factor of 3-4. As the result, the yield of maize, sugar beets, and sunflowers has risen substantially.

Now, according to plans developed in the sector, broad studies of complexones and metal complexonates have begun and are being conducted. Development is foreseen of the production of complexonates which makes possible an increase in the yield of cereal and industrial crops, fruit trees and vineyards, and additional weight in animal husbandry. Complexones help also against several serious illnesses of animals.

Large-tonnage productions of complexones and also specialized shops for small tonnage complexones and complexes will be built in the current five-year plan. The economic effect from the use of this product in power engineering, agriculture, petroleum extraction, and the food industry alone comprises not less than 400 million rubles per year.

An increase in the output of color televisions in recent years required an expansion of the product assortment and an increase in the quality of the luminophores produced by the sector. They are necessary also for the manufacture of electronic apparatus and for illumination engineering. Chemists developed and introduced the technology for obtaining luminophores for the very economical LB-40 fluorescent tubes, the use of which for lighting makes possible an annual economy of about 4 billion kilowatt-hours of electrical energy. A substantial economic effect is achieved by the introduction of one

more new technology--the regeneration of blue and green luminophores for color television in the process of the application of luminophores on picture tubes. This technology enables 30 percent of the expensive ultrapure substances to be returned to production. The industrial output which was begun recently also of an X-ray luminophore based on tungsten for X-ray screens has great significance for the national economy.

The enormous product assortment of substances produced by the sector allows the mention of only several other most recent achievements. The technology of new Soviet biochemical reagents has been developed now. The technology for obtaining derivatives of amino acids--the starting materials for manufacturing biologically active compounds for medicine and veterinary science--has been introduced into industry. The production of several reagents for gene engineering has been developed.

Scientific studies in the field of chemical reagents and ultrapure substances are being conducted according to the nine complex programs of the State Committee on Science and Engineering in close contact with the institutes of the academies of sciences of the USSR and Soviet Union republics and with many USSR higher institutes of learning. The Science Council of the USSR Academy of Sciences on the Problem of the Physical Chemistry and Technology of Ultrapure Substances created several years ago coordinates all this work.

It remains to develop technological processes for obtaining ultrapure substances for highly effective ferroelectrics and piezoelectrics, luminophores, optical converters, high-temperature dielectrics, substances for optic and quantum electronics, including for electron-beam picture tubes of color and black and white televisions, low-voltage indicators, special electroluminescent screens, lasers, and optical, semiconductor, and superconductive materials. The most large-scale scientific research and planning-design collectives will participate in this work, among them the General and Inorganic Chemistry Institute of the USSR Academy of Sciences, the Physicochemical Institute imeni A. V. Bogatskiy, the Physical Chemistry Institute imeni L. V. Pisarzhevskiy, the IRYeA, and the All-Union Luminophore Scientific Research Institute.

The development of the scientific bases of the synthesis and the separation of racemates of fluoro derivatives of amino acids is planned--with subsequent organization of their industrial production. Together with the IRYeA, the Yerevan chemical reagent plant will participate in this work. The collectives of the Physicochemical Institute imeni A. V. Bogatskiy and the All-Union Luminophore Scientific Research Institute will conduct a cooperative search for new luminophores.

The role of science at higher institutes of learning also will be increased in fulfilling the programs for new chemical reagents and ultrapure substances. A certain amount of experience has already accumulated here. It is worth mentioning, for example, the cooperative work of the Cherkassky chemical reagent plant and the Dnepropetrovsk Chemical-Technological Institute, as the results of which brilliance-forming additives to zinc-plating electrolytes and self-regulating additives for abrasion-resistant chrome-plating were developed and adopted in industry. These additives are already widely used at machine-

building plants--the quality of galvanized coatings sharply increased, and the amount of discharge harmful to the environment was reduced. Soviet additives made it possible to stop importing such substances. And the economic effect of this work over several years comprised about 10 million rubles.

The experience of the Cherkassky plant and the Dnepropetrovsk Institute will be widely disseminated. In conformity with the scientific-technical Reagent Program, the higher institutes of learning of the RSFSR are attracted to the development of new laboratory and industrial methods for the synthesis and production of chemical reagents. At the Ufa Petroleum Institute, a specialized cost-accounting experimental-test Ufa Reagent Factory was built, which was assigned the task of adopting the results of scientific research work carried out in the higher institutes of learning.

The cooperative forces of scientific and industrial workers will be directed toward a search for further means of technical renovation of small-tonnage chemistry enterprises. In the production of chemical reagents and ultrapure substances, as in no other sector, adaptable automated shops and sections with standardized modules of instrumentation and with robot-equipment complexes, are necessary today. Only such factories enable production to be renovated decisively and rapidly, computed in months, and if necessary, even in weeks, and to organize the output of new substances and materials upon urgent requests of science and practice.

Such are the basic tasks and plans of the sectors, which according to its dynamism and its place on the cutting edge of scientific and technical progress and the diversity of the products produced, truly have no equals.

12410
CSO: 1841/2

MACROCYCLIC CROWN ETHERS

Moscow KHIMIYA I ZHIZN in Russian No 8, Aug 86 pp 10-16

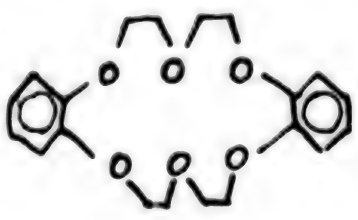
[Article by A. Iordanskiy, KHIMIYA I ZHIZN special correspondent, "Macrocyclic Compounds in the Product Assortment; A Continuation"; first two paragraphs at head of title]

[Text] The chemistry of macroheterocyclic compounds is among a number of new scientific directions, the development of which promises especially valuable practical results.

Studies in this direction were begun in the USSR at the end of the nineteen seventies. KHIMIYA I ZHIZN published the first paper on this subject in 1980. Now, all of six years later, Soviet scientists have attained leading positions in the development and study of these compounds, and mainly by the efforts of the intersector collective of scientists and workers of the chemical industry, their output has been organized on an industrial scale. We describe below how this was successfully achieved and tell about today's problems which face the new field of science and production.

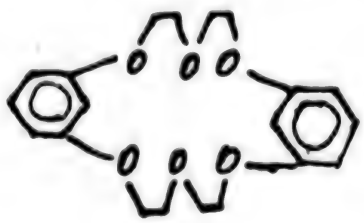
1. Dentures, Lassoes, and Cathedrals

In 1967, Charles Pedersen, a member of the scientific staff of the du Pont de Nemours company, published a paper in the JOURNAL OF THE AMERICAN CHEMICAL SOCIETY about the extraordinary complexing properties of a substance which he had obtained (according to modern nomenclature--dibenzo-18-crown-6):



This was the first publication on the subject of macrocyclic complexones. And if the subject is approached formally, it has not yet been twenty years for this new direction which has shown an enormous influence on all of modern organic chemistry.

Indeed, its roots, forerunners, and precursors were to be found in this discovery (Footnote *) (* The history of the discovery of macrocyclic complexones is detailed in the paper by Ye. N. Tsvetkov, "Crown Ethers, or Some Annoyances in Connection with Happy Accidents", KHIMIYA I ZHIZN, 1984, No 11). First of all, Pedersen himself, as it later became known, at that time had already spent five years synthesizing and studying macrocyclic polyethers. Most of all, the first macrocyclic polyether, very similar to dibenzo-18-crown-6

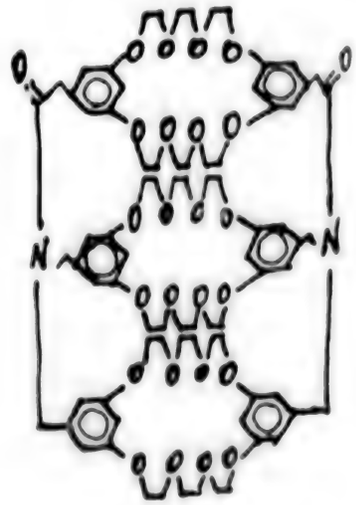


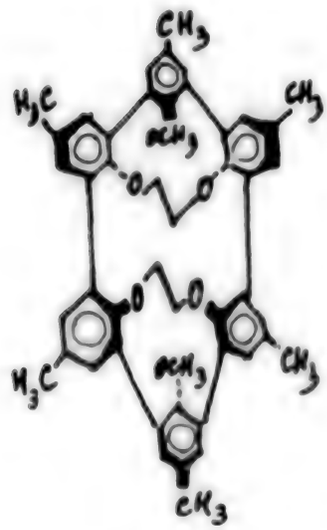
was synthesized as early as 1937. Natural complex-forming compounds of macrocyclic structure--porphyrins and corrins--have been studied intensively for decades, but natural antibiotic ionophores of the valinomycin type, also of macrocyclic structure and also containing ether groups, attracted great attention from bioorganic chemists in the 1950's and 1960's...

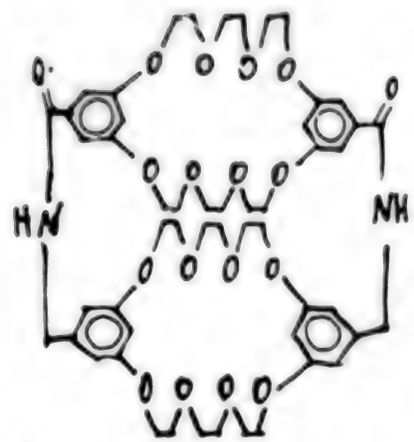
Nevertheless, only the publications of Pedersen, and somewhat later also of the French chemist J. M. Lehn, who studied another type of macrocyclic complexones--bicyclic nitrogen-containing polyethers, or cryptands, with complex clarity revealed the unique properties of such compounds, and obtained great resonance in most diverse fields of science.

It is not our intention to go into describing the details of the synthesis of macrocycles, the diversities of these compounds, their analogues, the nature of their extraordinary properties and mechanisms of complexing: we suggest that it would be interesting to turn to review journal publications of recent years (Footnote *) (For example: A. V. Bogatskiy and N. G. Lukyanenko. "Udivitelnyye makrotsikly" (The Amazing Macrocycles) (KHIMIYA I ZHIZN, 1980, No 2); A. V. Bogatskiy. "Makrotsikly na puti v praktiky" (Macrocycles on the Way to Practice) (Ibid, 1981, No 9); A. V. Bogatskiy. "Dostizheniya i novyye tendentsii v khimii sinteticheskikh makrotsiklicheskikh kompleksonov." (Achievements and New Trends in the Chemistry of Synthetic Macrocyclic Complexones (BIOORGANICHESKAYA KHIMIYA, 1983, No 11)), and even better--to study the special number of ZHURNAL VSESOYUZNOGO KHIMICHESKOGO OBSHCHESTVA IM. D. I. MENDELEYEVA (1985, No 5), the total issue of which is on the subject of crown ethers and their analogs.

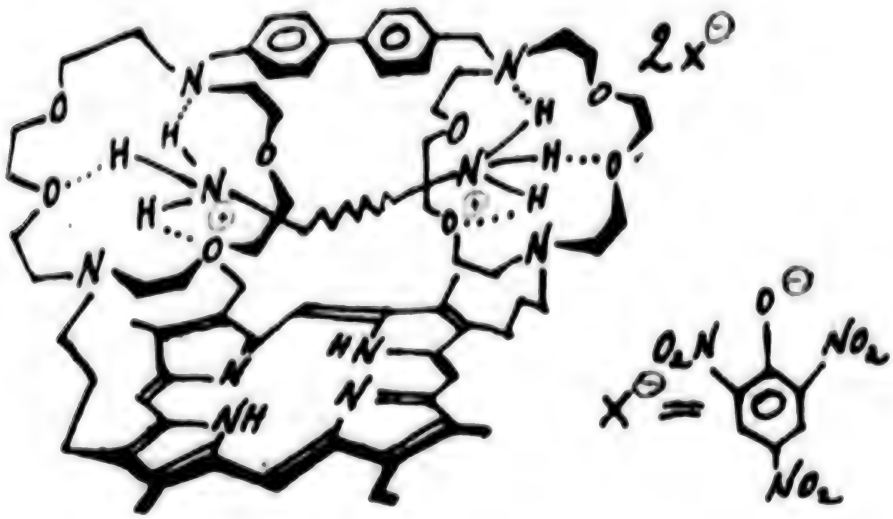
Let us say only that chemists throughout the world are now actively working on theoretical research on macrocyclic complexones and the development of the problems of their practical use. Many hundreds of such compounds of most remarkable structure have been synthesized. Frequently, one examination of their structural formulas, it seems to us, can convey purely esthetic enjoyment:







In essence, they already are not simply molecules, but, according to an expression of one of the researchers, are whole "molecular cathedrals". The words "permolecular substance" and "supramolecular chemistry" as applied to such structures do not appear accidentally in publications. This is completely rightful with reference, for example, to such a compound (obtained by J. M. Lehn):



This monster is called--nonamethylenediamine cryptate dipicrate.

By the way, the chemical names of such derivatives of molecular design in their elegance are greatly inferior to their structural formulas, and sometimes the language of chemical nomenclature does not completely succeed in conveying the particularities of their structure. Therefore, the discoverers of such structures excel in inventing descriptive terms: "clam-shells" and "butterflies", "lariats" and "sepulchrats", "jaws", and "tail-biting" are encountered in their scientific publications...

Finally, "cathedrals" are a rather exotic product of organic synthesis; however, the product assortment of more ordinary, popular macrocyclic compounds, which are already being produced by the largest chemical firms in the United States, Federal Republic of Germany, and Japan includes dozens of items.

A well-known specialist in this field, Professor F. Vögtle (Federal Republic of Germany), not without foundation, speaks of the resultant discovery of macrocycles as a new direction of chemistry which studies molecules not from the outside but from the inside and is concerned with their inner cavities; he considers that these intramolecular cavities play no less a role in practical human activity than the macroscopic cavities used since time immemorial: "niches, holes, basins, and pots"...

2. From Nothing to the Plant Shop

Work on the synthesis and study of crown ethers opened up in the Soviet Union only at the end of the 1970's. The UkSSR Academy of Sciences Physicochemical Institute in Odessa became the center of this research, and their inspiration was the director of the institute, the prominent scientist and organizer, UkSSR Academy of Sciences Academician Aleksey Vsevolodovich Bogatskiy (1929-1983).

It became clear very quickly, in the first place, that this direction of research actually is extremely promising, and, in the second place, that there are all the potentialities for developing it in earnest in the Soviet Union. The Kiev, Moscow, and Novosibirsk institutes are linked with the work. The new direction obtained the active support of the USSR Academy of Sciences in the person of Vice-President Academician Yu. A. Ovchinnikov (it can be noted here, by the way, that it seemed to be close to his scientific interests: indeed, to be precise, he directed the study of natural macrocycles--membrane-active complexones--for a period of almost two decades). To sum up, in 1979, the Presidium of the USSR Academy of Sciences authorized the first program of research on the basic problem "Macrocyclic Complexones and Their Analogs" for the five-year plan. A. V. Bogatskiy became the director of the program, and the current director of the Physicochemical Institute, Member-Correspondent of the UkSSR Academy of Sciences Sergey Andreyevich Andronati has been in charge since 1984.

Going ahead, let us say, that for the comparatively short time which has elapsed since that time, our lag in the field of basic research on macrocyclic complexones on the whole has been overcome, and whatever the level of the best foreign work was, it has been successfully surpassed. This concerns, first of all, methods for the synthesis of macrocycles (which Deputy Director of the Academic Program Nikolay Grigoryevich Lukyanenko is developing successfully at the Physicochemical Institute), the study of macrocyclic coordination compounds, and the biological activity of crown ethers.

But then, six years ago, it was necessary to provide researchers with a broad profile of work, and for this, macrocycles themselves were required above all. At that time, a considerable number of such compounds had already appeared in the catalogs of foreign chemical companies, but it is impossible to build a whole scientific direction on import procurements. Meanwhile, in the Soviet Union, certain macrocyclic compounds and their analogs were produced in very small amounts at the Moscow Chemical Plant imeni Voykov and at the experimental productions of the Physicochemical Institute in Odessa and the Organic Chemistry Institute in Novosibirsk. This clearly was insufficient.

The following step, taken a year later, to a high degree determined, perhaps, the whole later course of events. The study of macrocycles was included in the interdepartmental coordinated plan of the UkSSR Academy of Sciences and the USSR Ministry of the Chemical Industry, and on 14 October 1980, a joint order for the academy and the ministry was signed--with specific tasks assigned to the organizations responsible for their fulfillment, both academic and sector. In accordance with this plan, it was proposed to organize the industrial production of five compounds by 1985.

The designated level had already been reached two years earlier. And in 1985, not 5, but 15 different crown ethers and their intermediate products were produced, including 4 on a large scale--hundreds of kilograms.

Again, pay attention to this chronology:

the beginning of basic research on the completely new direction	1977
academic program	1979
interdepartmental plan with the participation of the sector	1980
fulfillment of this plan (instead of 1985)	1983
three-fold overfulfillment	1985

To some reader schooled by the difficult experience of adoption in practice, such results, perhaps, appear to be some kind of unprecedented idyll. The idyll is not an idyll, but on a background of complaints heard everywhere about the difficulty of industrial implementation of new ideas, this case actually appears untrivial.

What is going on here?

3. Complex on Enthusiasm

It can be said that the macrocycles were delivered. From the very beginning, people were working with them on an exceptional scale, who not only understood the importance of the work undertaken, but also thought constantly about possible practical applications.

A. V. Bogatskiy set the tone. By his enthusiasm he kindled that of the majority of those who now in one way or another have a relationship with the problem, beginning with the managers of the USSR Ministry of the Chemical Industry and ending with the rank-and-file workers of the Cherkassy Chemical Reagent Plant (where the production of macrocycles was developed), who up to the present time remember what inspiration was produced three years ago at the plant by a lecture about the remarkable properties of these compounds.

The sector actively maintained the initiative originating from academic scientists; also, let us say frankly, this is not a very prevalent situation. The science and engineering management of the USSR Ministry of the Chemical Industry included the problem in the coordinated plan developed in a special laboratory in Odessa, which in collaboration with the Physicochemical Institute works on problems of the practical use of macrocycles.

And one of the strongest institutes of the sector--the All-Union Scientific Research Institute on Chemical Reagents and Ultrapure Substances (IRYeA)--became the leading organization on the development of the technology of the production of macrocyclic compounds. The technologists at IRYeA established close contacts with "pure science". The task posed for them was not easy--to simplify laboratory methods of synthesis and make them suitable for plant production. "Those in the academy who carry out a synthesis in five steps, each in a new solvent, are happy, but there is little joy for us, because we will have to set up five separate solvent regeneration units," complained Oleg Viktrovich Ivanov, deputy of the IRYeA department. Solving such headaches, he

spent many months of these years at the plan, and in 1983, when the first large-scale installation was started up, even met New Year's Day there: on 31 December at 11 o'clock at night, he telephoned colleagues in Kiev, reported that they were already heating the first batch, and again set off to the shop...

The technology and apparatus were developed in a practically parallel manner, and at the same time at the plant they prepared for the production of the first experimental batches, and the following year the products just developed already appeared in the plant plan. All this was possible only due to the fact that the plant workers participated most enthusiastically in the implementation of the projects of the scientists.

"When we undertook this work, it was still completely incomprehensible how it might end and where it would go," says Valentin Vasilyevich Bykhov, director of the Cherkassy Chemical Reagent Plant and delegate to the 27th CPSU Congress. "Discussions with Aleksey Vsevolodovich Bogatskiy clarified many things. It became clear that today it perhaps will not yield a great result, but tomorrow macrocycles promise to produce a genuine revolution in many fields, especially in ours--in the production of reagents. Finally, we could drag out and finish several years later in order for science to update the technology to complete readiness. But we did not stop to do this, because it was already understood: here is our future; and it is necessary. And we began to develop everything which we could deliver. In my opinion, these are the normal relationships between science and production, and also must always be this way."

But again the assertion is not completely usual for the manager of a plant: thus "must be", we know, in actuality would not always be so far off. And these were not simply words. It is remembered at the plant up to this time, how before the start-up of the first large installation, when work did not go well, the director made plans twice a day in the shop. It turns out, for example, that someone did not do something, and he says, "Well, then, here is the telephone, call the planning department." He calls, "This is so-and-so, I am requesting that ten percent of the bonus be taken from me." (If you don't call yourself, they told me, the director will take away even more...")

It does not turn out to be without difficulties now also, and therefore an extremely active penetrating creative group on the development of crown ethers has been established which includes representatives of all plant subdivisions and promptly solves the problems arising in the course of work, from completion of raw material technologies to supply discrepancies.

And finally, there was still another organization to which in the epopee with macrocycles fell an important role to play. This is the Kiev Scientific-Research Center for Interdepartmental Scientific-Technical Work, one of ten such centers established by the USSR Ministry of the Chemical Industry in different regions of the USSR.

The center does not have a direct relationship with pure science or with specific production work--it essentially is an organization-intermediary. The Kiev center fulfilled the functions of regulator, and more precisely, a center

for crystallization of the efforts of different people and different departments. The center, and more precisely, the chief of the department, Vilyam Anatolyevich Veshitskiy, who became one more macrocycle enthusiast, brought people together, excited the organization, moved papers forward, planned conferences, and even procured some raw material for the Cherkassy plant: the development of production went so fast that suppliers accustomed to preparing orders in a timely way, did not keep pace.

The center conducted the enormous work of publicizing macrocycles to potential consumers and identifying scientific institutions which may be interested in these compounds and use them in their research efforts. Inquiries were mailed again and again to seventy, one hundred, three hundred and more addresses; those who did not reply were visited or telephoned, then the replies were analyzed, and business information and proposals for the directions of further work were formulated...This activity is being continued, and now it has acquired especially important significance, but more about this later on.

Yes, macrocycles were lucky; the enthusiasm and energy of such people as A. V. Bogatskiy, N. G. Lukyanenko, O. V. Ivanov, V. V. Bykhov, V. A. Veshitskiy and many others not mentioned here for lack of space, became the moving force which with extraordinary speed unwound the complex mechanism of intersector cooperation and enormously accelerated the achievement of results.

Is this a rare case? Yes, it is still infrequent--and therefore we said that macrocycles were lucky. However, to all appearances, such a conclusion does not remain this way for long. Recently a decree was adopted by the CPSU Central Committee and the USSR Council of Ministers on the establishment of intersector scientific-technical complexes and measures for provisions of their activity. Such complexes, to be established by the USSR Council of Ministers and accountable to it, will be oriented toward the conducting of a whole cycle of work on the establishment and development of the production of highly effective forms of new generations of engineering, technology, and materials. Scientific institutes, design-technological organizations, and experimental enterprises will all be included in them.

The multidepartmental collective of scientists, technologists, and production workers, which developed the industrial production of macrocyclic compounds was, in essence, a prototype of such scientific-technical complexes and to some degree blazed a trail marked for them. Only now the engine of scientific-technical progress will be started not only by personal enthusiasm as in this case (enthusiasm, for all its value, in economics can be compared to not more than hand control) but by the powerful controls of state management.

Meanwhile, 16 interbranch complexes have been established. This means that sixteen of the most important directions are still "lucky". And the experience accumulated in the work on the Macrocycle Program, in connection with the organizational methods outlined in the new decree, gives every reason for hoping that in the near future such "luck" becomes a large-scale phenomenon.

4. Let Us Collect Stones!

What we have been relating to some degree is already history. And now--we shall tell about present-day macrocycles.

Today, that is, at the beginning of 1986 (it is necessary to make such a reservation: the tempo is such here, that journal publications inevitably do not keep pace with life), 15 different macrocyclic and intermediate products for their synthesis are being produced. The product assortment is completely sufficient to provide for the majority of scientific research being conducted in this field in the USSR and basically eliminates the necessity for importing them. Twenty more products are planned for development by 1990. However, expansion of the product assortment already is not now the main task. The main task is to determine which compounds may become the most promising for large-scale use, and to concentrate efforts on them.

Work is continuing on the improvement of technology. In the next year and a half, probably, the possibility will arise of using new sources of raw materials--not the expensive synthetic intermediate products, but available and cheap by-products from several chemical productions. This will lower the production cost.

Conversion to automated installations, which plant designers, IRYeA technologists, and its apparatus-technological department in Dnepropetrovsk are now developing, will serve to make it cheaper. Meanwhile, some crown ethers are expensive: it is a long multistep synthesis, a part of the operations are done by hand, and the yields are very low. A kilogram of one of these products, for example, now costs neither more nor less than 45 thousand [rubles?].

But the production cost also as such, in general, is not the main thing; it strongly depends on the volume of production. Dibenzo-18-crown-6, which is the crown ester produced on the largest scale today and which is produced at the Cherkassy plant, from the first after it likewise "boiled" on the laboratory bench, rapidly became cheap, and now, when powerful installation exists for its synthesis, costs in all 145 rubles per kilogram.

Now the problem of the production "run" and problems of sale disturb production workers most of all. Everyone who is concerned with macrocycles is convinced: there is a large number of sectors where these substances can and must bring an enormous benefit. The price itself will be lowered when the output will be measured in kilograms, and even more, in tons. But not having a large-scale buyer with a guaranteed requirement, the plant cannot expand production. And even a guarantee does not always prove to be reliable: the same installation for synthesizing dibenzo-18-crown-6 was constructed under the completely firm order of a completely solid department, and then it did not confirm its requirement and has not accepted the product up to this time.

A stable and definite market apparently has not yet formed in this field, and it is not worthwhile to build large-scale installations intended for the production of a single product. And now the technologists of the IRYeA together with the plant workers are already planning renovation: on the basis of two existing large-scale installations, to which supplementary units and

blocks will be "harnessed", a multipurpose adaptable production complex will be built which is capable of producing as needed any product of an already developed product assortment. This idea originated very recently, but already is being translated into practice, and by the time this number of the journal reaches the reader, the complex, apparently, already will be ready. The style of the work has already been put together here in this way.

Well, how do things stand today with marketing?

Up to now the most encouraging outlooks for large-scale practical use of crown ethers apparently have been projected for agriculture.

The chemist A. K. Tashmukhamedova has already been working on macrocyclic compounds for a long time in Tashkent. One of the hundred and fifty new derivatives of dibenzocrown ethers which she has synthesized, as experiments have shown, increases the resistance of the cotton plant to a very dangerous disease--wilt. According to experimental data, spraying of plants with very low amounts of the preparation (two treatments of 50 g per hectare each) increases the yield of cotton by 10 percent. It is not excluded that cotton plantations of Central Asia will become the place of the practical debut of macrocyclic compounds.

And perhaps macrocycles will come onto the fields of the Ukraine even earlier. Tests conducted here in recent years showed that very small additions of one of the crown ethers to herbicides (300-400 g per hectare--this is already at current prices not more than 90 rubles, and with an increase in production will be even cheaper) will raise the effectiveness of herbicides by 15-25 percent, substantially lower their volatility, and decrease their harmful action on cultivated plants and soil microflora. The yield of kernels of maize increases from such an additive by 10-12 centners per hectare, of greens, by more than 120 centners per hectare, of sunflower seeds, by almost 4 centners per hectare, of sugar beet roots, by almost 30 centners per hectare, and the yield of sugar, by 6 centners per hectare.

And still, in principle, industry remains in an untouched domain for the use of the attractive potentialities of macrocyclic compounds, primarily the chemical industry, for which they must represent especially great interest.

This is the reason why the Kiev center is not tired of bombarding hundreds of potential customers with inquiries. "We are still only scattering stones," says V. A. Veshitskiy. "The time to gather them has not yet come." This is the reason why we still do not regret the one and a half journal pages to do our bit in advertising these wonderful compounds. Perhaps one of our readers will take it into his head to try them--and is it not possible with their help to solve the specific practical task facing him and to use them for intensification of the technological process and for the improvement of economic indicators? Then he can appeal to Moscow, Odessa, Kiev, and Cherkassy: if the matter is worthwhile and they produce the substance, and they help the council...

Macrocycles stand at the threshold of practice. They are waiting for the time when they will be invited in.

12410
CSO: 1841/2

USES OF CROWN ETHERS

Moscow KHIMIYA I ZHIZN in Russian No 8, Aug 86, pp 16-17

[Unattributed article: "Crown Roles of Crown Ethers"]

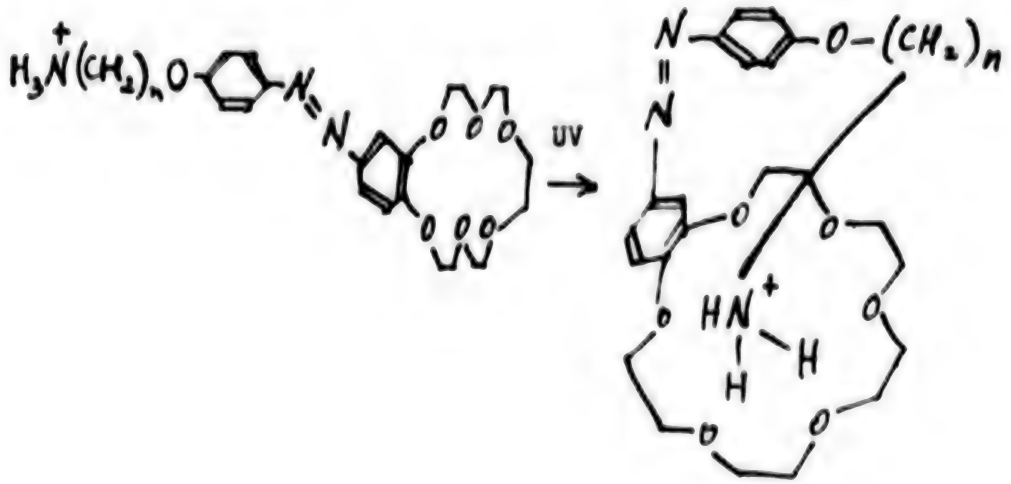
[Text] Crown ethers and cryptands are exceptionally effective, not infrequently unique reagents for organic synthesis. By forming stable lipophilic complexes with organic or inorganic ions, they can transfer such ions from the aqueous or solid phase to the organic, change the state of ion pairs in solution, and, due to this, show a marked effect on the kinetics and stereochemistry of many reactions. Crown ethers can be widely used as catalysts and modifiers of reactions of nucleophilic substitution, oxidation, reduction, etc. The implementation of such reactions in the organic synthesis industry in many cases would produce a lowering of the energy consumption of the production, increase the yields of products, and eliminate the use of toxic, dangerously explosive, and scarce reagents.

The capability of macrocyclic compounds is strongly selective, depending on the arrangement of its intramolecular cavity, in capturing and retaining certain ions and makes them highly effective specific extracting agents: by using them, one can successfully extract metal from lean ores, gold from solutions, uranium from seawater, and calcium from hard water, and also purify wastewater from harmful impurities, including atomic production (for example, the addition of several percentages in all of 24-crown-8 enables 99.9 percent of the cesium and strontium to be extracted). Such a method, by the way, can remove from an organism the radioactive substances or toxic heavy metals which have fallen on it.

Crown ethers enable all kinds of metals, from alkali to transuranium, and even their isotopes, to be separated. Optically active crown ethers exist which differentiate, for example, L- and D- amino acids and separate their mixtures. The high specificity of the reaction enables crown ethers to be used in analysis--as sensitive sorbents for chromatography or ion-selective membrane electrodes, with high precision determining the presence in complex physiological and technological solutions of copper, chromium, lithium, rubidium, cesium, and other ions.

Such macrocyclic complexones were developed recently, the properties of which can be directed by changing their specificity by particular external

reactions. For example, one of the derivatives of benzo-18-crown-6 specifically binds the potassium ion. If, however, it is illuminated with ultraviolet light, instead of the ion, the interior cavity of the molecule captures its own ammonium "tail" (such crown ethers have also received the designation "biting itself by the tail"), and the affinity for potassium is reduced:



Other "reversible" crown ethers have also been designated which can respond to a change in the pH of the medium, the redox potential, etc.

Macrocycles can entrap in the cavity of their molecule not only ions, but also different atoms, and also neutral organic molecules, sometimes of quite substantial dimensions. Because of this, it is possible to use them for "packing" different organic compounds in order to mask temporarily particular properties which are undesired for them (volatility, solubility, and toxicity) in the production of fragrances, medicinal preparations, and insecticides.

The newest direction in the study of macrocycles is related to their physiological activity. Many macrocyclic compounds possess antimicrobial and antiparasitic properties and are capable of regulating the work of the heart, preventing arrhythmia and fibrillation. At first it was assumed that the action mechanism here is the same as that of a natural macrocycle--the antibiotic valinomycin, which selectively entraps the potassium ion and "drags" it through the cell membrane. However, such macrocycles apparently act only on microorganisms, and such a direct ionophoric effect has not been successfully recorded in higher animals; probably the powerful systems maintaining homeostasis disturb it. And now it is thought that the effect is not so much in the ionophoric action as in the change under the action of macrocycles of the properties of the ionic channels of the membranes.

Macrocycles apparently also act on plants in a similar way. Specifically, by binding with alkali and alkaline earth cations, which play a deciding role in the functioning of membranes and the regulation of the activity of membrane enzymes, they open up great potentialities for controlling the state of the plant organism.

It is possible by means of crown ethers to "pull" through natural barriers of the organism, and most of all hematoencephalic, particular physiologically active substances which by themselves cannot overcome such an obstacle. This opens up prospects for direct pharmacological action on the brain. The UkSSR Academy of Sciences Physicochemical Institute has already obtained such "hybrid" medicinal preparations which, by acting directly on the brain receptors, improve the processes of thought, memory, and training, and markedly exceeds in effectiveness existing preparations of such a type as nootropyl (piracetam). Now its clinical tests are beginning.

At the beginning of 1986, the Cherkassy chemical reagent plant was producing eight different crown ethers:

dibenzo-18-crown-6, "pure", for hydrogenation,
dibenzo-118-crown-6, "chemically pure",
18-crown-6,
15-crown-5, for catalysis
15-crown-5, "pure",
diaza-18-crown-6,
benzo-15-crown-5,
dibenzo-24-crown-8--

and six intermediate products for their synthesis:

1,8-dichloro-3,6-dioxaoctane,
1,8-diamino-3,6-dioxaoctane,
tetraethyleneglycol,
pentaethyleneglycol,
1,11-dichloro-3,6,9-trioxaundecane,
1,8-ditosyl-3,6-dioxaoctane.

In addition, the experimental plant of the All-Union Scientific Research and Planning Monomer Institute in Tula produces dicyclohexane-18-crown-6 on an industrial scale.

In addition, this year the Cherkassy plant will begin to produce (and next year will be able to supply potential customers) three more crown ethers: 12-crown-4, benzo-18-crown-6, and aza-15-crown-5.

And in conclusion: here are the addresses to which organizations wishing to use macrocyclic complexones in their research and development can write:

Physicochemical Institute imeni A. V. Bogatskiy of the UkSSR Academy of Sciences, 270080 Odessa, Chernomorskaya Doroga, 86;

All-Union Scientific Research Institute for Chemical Reagents and Ultrapure Substances, 107076 Moskva, Bogorodskiy Val, 3;

Kiev Scientific Research Center for Interdepartmental Scientific-Technical Work, 252167 Kiev GSP [as published], Ul. Mariny Raskovoy, 15;

Cherkassy Chemical Reagents Plant imeni XXV Syezd KPSS, 257011 Cherkassy Obl., Ul. 60-Letiya SSSR

12410
CSO: 1841/2

PROBLEMS IN INTRODUCING NEW CHEMICAL PRODUCTS

[Editorial Report] In Moscow Moscow Television Service in Russian 0630 GMT 28 Oct 86 journalist B. V. Goldayev presented a segment of the television serial "Science and Life" entitled "Innovators and Conservatives." The program began with Goldayev interviewing A. D. Korchagin, deputy director of the All-Union Scientific Research Institute of State Patent Expertise in Moscow, which is subordinate to the USSR State Committee for Inventions and Discoveries. Korchagin said that the institute has files on some 1.2 million inventions and that the institute processes about 500 inventions a year. However, only a little over 30 percent of the inventions are introduced, he said. He added that a strange situation arises when all realize that an invention will produce results and yet there is unwillingness to implement the invention.

Speaking about introduced inventions, Goldayev noted that there are instances of "branches of industry refusing to introduce advanced technology on a large scale." After looking at a patent for glue developed by R. A. Vaselovskiy and Ye. I. Fedorchenko of the Institute of the Chemistry of High Molecular Weight Compounds, Ukrainian SSR Academy of Sciences, Goldayev said that "billions of rubles have been lost during two 5-year plans because the Ministry of the Chemical Industry failed to introduce the invention on a large scale."

The video screen then cut to shots of the Institute of the Chemistry of High Molecular Weight Compounds in Kiev, with Goldayev saying that a glue named "Sprut" with unique properties was developed at the institute 10 years ago. He went on to describe some applications of the glue such as repairing underwater pipelines, mining equipment, and corroded ship decks and pipes. Goldayev then noted that "specialists are ready to use the new glue everywhere, but there is just one small obstacle. There is no glue available because this unique glue is virtually not produced in the country."

The video then cut to N. D. Trifonov, director of the Experimental Production Department of the Institute of the Chemistry of High Molecular Weight Compounds, who says that output of Sprut glue is only 300 tons because of limited facilities.

The video then cut to Goldayev, Ye. B. Lebedev, director of the Institute of the Chemistry of High Molecular Weight Compounds, and R. A. Veselovskiy, doctor of chemistry, discussing the production of Sprut glue.

The video cut to shots of Goldayev with Yu. M. Luzhkov, administrative chief at the USSR Ministry of the Chemical Industry (MINKHIMPROM); M. S. Bakirov, chief of "Soyuzkhimsashchita" Association of the USSR Ministry for the Production of Mineral Fertilizers; and L. Ye. Komarov, first deputy chairman of the USSR State Committee for Inventions and Discoveries, discussing Goldayev's report.

Luzhkov stated that the order for the industrial production of Sprut glue was issued in 1978 to MINKHIMPROM and that the task was given to the Ministry for the Production of Mineral Fertilizers when MINKHIMPROM was split into two. He said that when the issue came back to MINKHIMPROM in 1985, the ministry decided to organize glue production at enterprises in Kuybyshev and Tambov.

Bakirov asserted that Sprut glue production was delayed when MINKHIMPROM was split up and that "a plan approved by MINKHIMPROM provided for organizing production in one of the buildings of the experimental plant under its jurisdiction." He claimed that transfer of the building has been indefinitely delayed and that despite efforts, MINKHIMPROM has not provided a building. Bakirov stated that glue production will be organized in 1987.

Komarov then spoke about preconditions and problems with the development and introduction of inventions, and Luzhkov discussed material incentives in the field.

/9716
CSO: 1841/49

UDC 66.01

CURRENT ADVANCES IN THEORY AND PRACTICE OF CHEMICAL TECHNOLOGY

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 9, Sep 86 (manuscript received 11 Nov 85) pp 1908-1920

[Article by V.V. Kafarov]

[Abstract] Studies on chemical processes as practiced in chemical technology have become more sophisticated with reliance on more refined mathematical models, conversion of the mathematical models into computerized models, and the use of the latter in computer simulation and control. Systems analysis of such processes is based on resolution of the chemical process into its detailed components, their identification, and formulation of hierarchic relationships. The nonlinear nature of the majority of chemical processes, various forms of instability and stochastic nature of the interrelationships among the components and subsystems in the process renders simulation and analysis extremely difficult and complex. Qualitative details are provided on a system applicable to plant-scale chemical processes producing a variety of products, designated as the 'flexible automated industrial system' [GAPS]. The implementation of GAPS and continuous improvements resulting from increasingly improved software have already been felt in the Soviet chemical industry in cost-effective terms. Not the least of the benefits is derived from GAPS is the release of many workers for other more labor-intensive occupations. Figures 3; references 19 (Russian).

12172/9716
CSO: 1841/30

UDC 66.012-52

EQUILIBRIA: AUTOMATED SYSTEM FOR MODELING LIQUID-VAPOR SEPARATION

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 9, Sep 86 (manuscript received 9 Nov 85) pp 1934-1940

[Article by I.V. Bancheva, R. Stateva and Khr. Boyadzhiyev]

[Abstract] Description is provided of the working aspects of the EQUILIBRIA system written in Fortran for modeling liquid-vapor separation applicable to

chemical systems. The program has been written to model organic and inorganic systems over wide temperature and pressure ranges, including critical and supracritical portions of the phase diagrams. A schematic of EQUILIBRIA is presented illustrating the macrostructure of the system, consisting of an execution block, modeling block, auxiliary block, and a mathematical block tying-in more than 100 individual program units. The advantage of the EQUILIBRIA system is that it has general applicability and precludes the need for additional programming. References 12: 1 Russian, 11 Western.

12172/9716
CSO: 1841/30

COAL GASIFICATION

COAL PIPELINE FOR KATEK

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 20 Feb 86 p 2

[Article by Candidate of Economic Sciences A. Avakyan, section head, and Doctor of Technical Sciences V. Butkin, director, KATEK [Kansk-Achinsk Energy Complex] Scientific Research Institute of Coal, and Candidate of Technical Sciences I. Protsaylo, director, Siberian Branch, All-Union Thermotechnical Institute, Krasnoyarsk]

[Abstract] Timely delivery of coal from the Kansk-Achinsk basin to other areas of the USSR requires the development of a network of pipelines spanning many thousands of kilometers. In order to bring the plans for the pipeline system to fruition and to render the entire project as cost-effective as possible, extensive feasibility studies are being actively pursued by specialists from various areas, with the anticipation that construction will commence by 1990. Many technical problems remain to be solved and resolved, and it remains to designate the ministry that will bear primary responsibility for this undertaking. However, this new development in the life of the KATEK will increase its economic value to the USSR and provide an impetus for further advances of the Soviet socialist economy.

12172/9716
CSO: 1841/421

COMBUSTION

UDC 541.124.2'127:542.943:546.281

MECHANISMS OF SILANE OXIDATION IN TWO-STAGE SELF-IGNITION PROCESSES IN CLOSED SYSTEMS

Moscow KINETIKA I KATALIZ in Russian Vol 26, No 6, Nov-Dec 85 (manuscript received 26 Dec 84) pp 1292-1296

[Article by V. V. Azatyan, V.A. Kalkanov and A.A. Shavard, Institute of Chemical Physics, USSR Academy of Sciences, Moscow]

[Abstract] Mass spectrometric studies on the products of silane oxidation at 400 K and initial pressure of 5×10^{-6} mmHg led to the first unequivocal demonstration of water formation. Manipulation of the pressure in the reaction vessel may be used to vary the concentrations of the products, H_2 and H_2O, tenfold. The results were attributed to a two-stage self-ignition process, with the first ignition favoring the formation of H_2 ($SiH_4 + O_2 = SiO_2 + 2H_2$), while the second ignition leads to water formation ($SiH_4 + 2O_2 = SiO_2 + 2H_2O$). Surface modification by the flame alters the course of the reaction, precluding water formation, while not affecting hydrogen production. Figures 1; references 16: 11 Russian, 5 Western.

12172/9716
CSO: 1841/401

UDC 621.762

HIGH TEMPERATURE DURABILITY AND CREEP OF NbC DURING ELONGATION

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNOLOGIYA in Russian Vol 29, No 6, Jun 86 (manuscript received 24 Apr 1984) pp 80-83

[Article by S. S. Ordanyan and G. A. Savelyev, Department of Chemistry and Technology of Fine Industrial Ceramics, Leningrad Technologic Institute imeni Lensovet]

[Abstract] There is very little information on high temperature durability and creep of carbides during elongation. Data are given on the strength of NbC during elongation at 300-3500°K and on creep at 2100-3500°K for NbC samples of 4.2 and 8.0 % porosity. "Peak" strength was established at $T_{exp}/T_{m.pt.} = 0.7$. Two temperature regions of creep with different activation energies are present. From creep and its relationship, ln = 1/T, energy of activation for both temperature regions was calculated. Activation energy for high temperature creep was 440 kjoule/mole and is independent of stress and porosity. At low temperature, it is 75-105 kjoule/mole. The effect of stress on the rate of creep is exponential. Equations for the rate of creep are given for NbC of both porosities at various stresses for the low and high temperature regions. From these equations the rate of creep and total deformation for specific times can be calculated. Microstructure studies showed that creep during elongation leads to discontinuities-fractures, whose number increases with an increase in total deformation, particularly at the pores and grain boundaries. Figures 3; references 9 (Russian).

1286/9716
CSO: 1841/5

UDC 666.798.2

EFFECT OF DISPERSION OF STARTING POWDERS ON STRUCTURE FORMATION OF COMPOSITION IN TiN-AlN SYSTEM DURING SINTERING

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNOLOGIYA in Russian Vol 29, No 6, Jun 86 (manuscript received 25 Feb 1985) pp 84-86

[Article by S. O. Krylov, T. V. Krivko, Ye. K. Stepanenko and S. S. Ordanyan, Department of Chemistry and Technology of Fine Industrial Ceramics, Leningrad Technologic Institute imeni Lensovet]

[Abstract] TiN powders of 4-40 μm and ultradispersed powders of TiN and AlN of 0.03-0.07 μm were used to study the effect of particle size ratio of the starting powders on the structure of sintered composition of TiN-AlN. To obtain coarsely dispersed AlN, brickets from ultradispersed AlN were sintered at 1750°C in a N_2 medium and then crushed to d = 2-10 μm. From these powders a series of charges were prepared with particle diameter ratios of AlN (dielectric) and TiN (conductor) of 0.0003 to 800 over a 5-95% concentration range. Prismatic samples of 5x5x45 μm were obtained from these mixtures by hot pressing. Microstructure studies indicated that a change in the ratio of particle sizes of the starting powders (d_{AlN}/d_{TiN} = 800, 1, 0.0003) at the same concentration of components (20% TiN-80% AlN) can lead to different types of structures. For a composition of equal concentration of ultradispersed powders of TiN-AlN, a structure is formed that is similar to the eutectic of the coarse conglomerate. Also, the concentration threshold of transition from one structure to another changes in the sintered materials using powders of different dispertions. Samples of TiN-AlN with different amounts of the dielectric (AlN) were studied to determine the specific electroresistance of materials with different microstructures at d_{AlN}/d_{TiN} = 800, 1, 0.0003. By varying the composition and ratio of the dimensions of the powders, the structure of the composition can be modeled to obtain TiN-AlN materials with required values of electroresistance. Figures 2; references 6: 5 Russian, 1 Western.

12886/9716
CSO: 1841/5

UDC 531.226.33

FERROELECTRIC AND ANTIFERROELECTRIC SOLID SOLUTIONS OF $Pb(Ti,Zr,Sn)O_3$ WITH HIGH Zr CONCENTRATION AT HIGH PRESSURES

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: KHIMIYA Vol 27, No 4, Jul-Aug 86 (manuscript received 15 Feb 1985) pp 428-431

[Article by O. K. Gulish, I. N. Polandov, N. S. Alekhina and A. D. Feronov, Department of Physics and Chemistry of High Pressures]

[Abstract] Materials corresponding to a region near three phases on a phase diagram were selected to study electric properties of ferroelectric ceramics

at phase transitions from ferroelectric to antiferroelectric states induced with hydrostatic pressure. The effect of composition on these properties in solid solutions of $Pb(TiZrSn)O_3$ was investigated. Two groups of solid solutions were studied with general formula:

$Pb_{0.995}\{[Ti_x(Sn_yZr_{1-y})_{1-x}]_{0.99}Nb_{0.01}\}O_3$. In the first group, six different compositions of concentration compounds Ti-Sn-Zr were selected where $x = 0.0450$, 0.0475, 0.0525, 0.0550, 0.0575 and 0.0600; $y = 0.20$. Dielectric permeability as a function of pressure (up to 6-7 kbar) at room temperature was investigated for the solid solution. These compositions are ferroelectric and form the phase boundary with the antiferroelectric region. Six compositions of a second group of solid solutions were studied where $y = 0.30$; $x =$ 0.0500, 0.0550, 0.0600, 0.0650, 0.0700 and 0.0750. Materials of this group are directly near the triple point of the phase diagram, where compositions 0.0650-0.0750 are ferroelectric, 0.0600-0.0550 correspond directly to the phase boundary ferroelectric (rhombohedron)-antiferroelectric (rhombic), and 0.0500 is in the antiferroelectric region. Increasing the Ti content, in the solid solutions, increases the dielectric permeability in the first group; the pressure-induced phase transitions occur at 4 kbars; a linear relationship exists for phase-transition pressures (up to 3 kbar) versus Ti content (up to 6%). Hysteresis of the phase boundary is significant not only for temperature and electric field but also for hydrostatic pressure. In group 2, phase transitions, induced with pressure, occur at pressures not exceeding 4 kbar, where significant hysteresis was observed. Figures 4; references: 4 Russian, 2 Japanese.

12886/9716
CSO: 1841/10

UDC 542.953/954

CHEMICAL INTERACTIONS IN FORMATION OF EPITAXIAL CADMIUM TELLURIDE FILMS ON MICA

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 8, Aug 86 (manuscript received Jan 86) pp 1680-1686

[Article by V. I. Rubets, K. K. Muravyeva and I. P. Kalinkin, Leningrad Institute of Technology imeni Lensovet]

[Abstract] A study is presented of the chemical phase composition of films produced by vacuum condensation of cadmium telluride on muscovite mica in a semi-closed volume at a residual gas pressure of $3 \cdot 10^{-3}$Pa (10^{-4}mmHg) at 50-750°C. The structure and composition of the films was studied by x-ray diffractometry and microdiffraction. Morphologic studies were performed with both optical and electron microscopes. It was found that the condensation of the films is a complex process under these conditions, forming a film of hetrogeneous chemical composition, quite different from cadmium telluride. The film components included CdTe, TeO_2, CdO, $CdTeO_3$, K_2TeO_3, and $CdTeO_3 \cdot TeO_2$, formed both by interaction of cadmium and tellurium vapors with the chemically-active residual oxygen and water vapors, and by possible solid-phase reactions in the film itself and at the film-substrate interface. When the vacuum system was washed with argon, pure cadmium telluride fioms were produced. Figures 4; references 5: 4 Russian, 1 Western.

6508/9716
CSO: 1841/13

UDC 669.018.45:669.788

ADSORPTION OF HYDROGEN BY ZnNi INTERMETALLIDE WITH PARTIALLY SUBSTITUTED COMPONENTS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 8, Aug 86 (manuscript received 20 Nov 84) pp 1865-1866

[Article by I. M. Shalya, M. M. Antonova, S.N. Yendrzheyevskaya, Yu. G. Pruyealov and O. T. Khorpyakov, Institute of Material Science Problems, Ukrainian SSR Academy of Sciences]

[Abstract] Studies of alloying of the intermetallic compound ZrNi were performed in an attempt to decrease the optimal adsorption temperature and increase the adsorption capacity of the material. X-ray analysis of the sintered material showed that very slight additions of the alloying elements formed a solid solution of the metal in the intermetallide. Higher contents of the alloying element resulted in interaction during sintering forming new intermetallic compounds. The adsorption capacity of the alloyed ZnNi was influenced as follows: The addition of small quantities of La increased adsorption capacity, while Mo decreased it. The optimal adsorption temperature for all compositions studied was near room temperature, though adsorption and desorption rate of hydrogen decreased greatly for the hydrides alloyed with lanthanum and molybdenum. The addition of lanthanum decreased the desorption temperature to room temperature, while molybdenum shifted it to 773-873 K. Figure 1; references 4: 2 Russian, 2 Western.

6508/9716
CSO: 1841/13

UDC 541.13 : 666.113

STUDY OF PROCESSES ON SURFACE OF ELECTRODE GLASSES TREATED IN ACID FLUORIDE SOLUTIONS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 8, Aug 86 (manuscript received 6 Jan 86) pp 1732-1737

[Article by V. S. Bobrov, Ye. V. Bokova and G. Buke]

[Abstract] An attempt was made to relate the results of earlier works--in which it was shown that the composition of an acid fluorine-containing solution has a significant influence on the potential of a glass electrode--to processing occurring on the surface of the glasses in solutions. NaEa-2006 silicate glass was studied, containing 20 mol.%Na_2O, 6 mol.%CaO and 74 mol.%SiO_2. Experiments were performed to determine whether the differences in glass surface properties observed in the previous work were macroscopic and could be observed by direct analytic methods. The glass specimens were treated for 5-6hr at 95°C in 0.5n solutions of HCl containing 0.1, 0.01 or 0.001n NaF, cooled and the specimens washed in 0.01n HCl for 5 seconds. The specimens were then held in small volumes of 0.01 N HCl to determine the yield

rate (diffusion rate) of fluorine ions and sodium ions from the glass surface. The experimental data confirmed that the asymmetry potential is related to the formation of altered layers on the surface of the glass upon exposure to the solutions, including processes not equivalent to ion exchange. Figures 3; references 8: 6 Russian, 2 Western.

6508/9716
CSO: 1841/13

UDC 541.135

STUDY OF INFLUENCE OF CERTAIN IMPURITIES IN ELECTROLYTE ON PROPERTIES OF COPPER ELECTROLYTIC FOIL

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 8, Aug 86 (manuscript received 4 Apr 85) pp 1743-1748

[Article by O. G. Lokshtanova, P. M. Vyacheslavov, G. K. Burkat, N. P. Yermakova and L. A. Kabanova]

[Abstract] A study was made to determine the influence of various impurities in the electrolyte on the quality and properties of copper electrolytic foil and to determine permissible limits of impurity concentrations. Experiments were performed on a laboratory electrolyzer with rotating titanium drum cathode. The properties of the foils were studied by standard methods determining microhardness, resistivity, ductility, density, porosity, tensile strength, relative elongation and roughness. The influence of the chloride ion on the structure, surface and properties was studied with lead, copper and platinum-titanium anodes. An increase in chloride ion content from 5 to 20 mg/l increased roughness from 1 to 2.5 μm, and further increases increased roughness to 3-4 μm. Microhardness and resistivity did not change with chloride ion content, while ductility first increased, then remained constant, then dropped rapidly with lead anodes. Permissible contents of chromium, calcium and magnesium were found to be 20, 30 and 60 mg/l. All properties had a maximum at 30-60 mg/l iron in the solution, producing foils with uniform microrelief, good corrosion resistance and practically no dendrites. Over 60 mg/l nickel causes a significant change in microrelief, with finer grain structure and reduced number of dendrites. The cobalt ion significantly decreases dendrite formation and produces finer structure at 100-11150 mg/l. Zinc changed only the relative elongation and microhardness, producing a slight increase in ductility. Aluminum at over 100 mg/l increased the number of dendrites and decreased ductility. Contamination with industrial oil up to 20 mg/l increased ductility, while higher concentrations decreased the quality of the foils. Figures 3; references 8: Russian.

6508/9716
CSO: 1841/13

UDC 547.241+632.95

SYNTHESIS AND PESTICIDE ACTIVITY OF SOME DERIVATIVES OF METHYLENEDIPHOSPHORUS-CONTAINING ACIDS

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: KHIMIYA Vol 27, No 4, Jul-Aug 86 (manuscript received 13 May 1985) pp 401-407

[Article by Z. S. Novikova, I. L. Odinets, I. F. Lutsenko, N. G. Rozhkova, G. L. Abramova and Ye. I. Andreyeva, Department of Organic Chemistry]

[Abstract] The following derivatives of methylenediphosphorus-containing acids were prepared; their experimental conditions and properties are given: (i-PrO)(PrO)P(O)CH_2P(OPr-i)$_2$, (i-PrO)$_2$P(S)CH_2P(S)(OPr-i)$_2$, (i-PrO)$_2$P(O)CH_2P(S)-(OPr-i)$_2$, (i-PrO)(Cl_2C=CHO)P(O)CH_2P(OPr-i)$_2$, [(i-PrO)(Cl_2C=CHO)P(O)]$_2CH_2$, (I-PrO)[Pr(i-PrO)CH]P(O)CH_2P(OPr-I)$_2$, (i-PrO)[Et(i-PrO)CH]P(O)CH_2P(OPr-i)$_2$, [(EtO)[Et(EtO)CH]P(O)]$_2CH_2$. Composition and structure of these compounds were confirmed by element analysis and nuclear magnetic resonance spectra of ^{31}P and ^{1}H. These compounds and other similar types were investigated for their pesticide activity in fungicide and herbicide activity tests. Data are given of pesticide activity tests on 21 derivatives of methylenediphosphorus-containing acids. Compounds of this type display growth regulation, fungicide, herbicide and aphicide activity. Of all the compounds studied, only 0,0-diisopropyl(O-isopropyl)-α-isopropoxybutylphosphoryl)methylphosphonite had aphicide activity (85% mortality). Pesticide activity is characteristic of compounds containing isopropyloxyl radicals at the phosphorus atom. References: 7 Russian.

12886/9716
CSO: 1841/10

PETROLEUM PROCESSING INDUSTRY

IRRESPONSIBILITY IN BAKU MACHINE CONSTRUCTION INDUSTRY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 22 Feb 86 p 2

[Article by D. Melikov, correspondent, Baku]

[Abstract] A recent meeting of the Central Committee of the Communist Party of Azerbaijan involved both party representatives and economists in a discussion of the sorry state of the machine construction industry in Baku. The industry, which is responsible for major equipment and supplies for the oil-drilling industry, has fallen below schedule in its deliveries and its output is shoddy and unreliable. The basic problems are irresponsibility, poor organization, virtual absence of quality control, and excessive reliance on manual labor rather than automation. A plethora of commissions have been created to rectify the situation, but their primary activity at every plant appears to consist of endless rounds of talks which do not lead to concrete measures. Considering the fact that the Main Administration for Oil Machinery Construction has some 4260 communists on its payroll--a fifth of the workers--it seems that their talents could be utilized in a more forceful manner to effect positive changes. This, in effect, was the conclusion of Comrade K. Bagirov, First Secretary of the Azerbaijani CP.

12172/9716
CSO: 1841/421

POLYMERS AND POLYMERIZATION

FIRST MAGNETIC POLYMERS DEVELOPED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 4 Nov 86, p 1

[Author] Lagovskiy, V., correspondent (Moscow)

[Excerpt] For the first time in the world, Soviet scientists from the USSR Academy of Sciences' Institute of Chemical Physics have obtained magnets from a polymer.

Nowhere else on Earth is there such a substance. I was shown small black granules clinging to a metal bar. Real magnets--but they are organic ones. If the granules are joined together, one large magnet results.

"What's so special about this?", I asked Correspondent Member of the USSR Academy of Sciences A. Ovchinnikov, one of the authors of this work. "Are polymer magnets stronger than iron magnets?"

"No, they are probably weaker," Aleksandr Anatol'yevich admitted, "but this is not what is important. Magnetic organic materials have a multitude of other valuable properties, which, by the way, can be altered as desired. They possess all the positive characteristics which distinguish polymers from metals--light weight, elasticity, and corrosion resistance."

Every electron in a molecule of any substance has magnetic moments, but these moments are oriented in such a way that they cancel each other. Imagine, for example, two evenly matched teams in a tug-of-war: much effort is exerted, but there is no movement. Why not transfer some of the players from one team to the other--deploy the magnetic moments in such a way that they create a field after all? In his theoretical work, A. Ovchinnikov had proved as early as 1977 that modern chemistry could accomplish this feat. All that remained was to do it.

"Rotating the moments is easy," said Candidate of Physical-Mathematical Sciences V. Spektor, joining the conversation. "But how do you fix this state permanently in a substance? Many have tried both here and abroad, but only the team of specialists headed by Doctor of Chemical Sciences Yu. Korshak at the Moscow Chemical Engineering Institute imeni Mendeleyev was successful. I think they solved a problem no less difficult than the one solved by the biophysicists who first synthesized the DNA molecule: they learned how to join molecules together in a definite order."

Several years of joint effort went into the search for the necessary conditions of synthesis before the first granules of the unique material were produced in a chemical reactor.

Scientists have no intention of replacing conventional metallic magnets with organic ones. The organic ferromagnets will find their own specific applications. Imagine transducers which operate by themselves--entirely without a power supply. The point is that the magnetic polymers can be easily 'trained' to respond quickly to changes in their environment.

Magnetic polymers can be stretched into a very thin film, and its polarity can be reversed almost instantaneously by the slightest action on it. This means that organic substances can become compact, lightweight memory elements in high-speed computers.

The very first experiments with the new substance have shown that its magnetostriction is enormous. In simple terms, the magnetic moments of the polymers change tens of thousands of times when even slightly stretched or compressed. What is more, there are different reactions depending on which direction the stretching force is applied--along the axis or across it. It would be difficult even to enumerate all the possible applications of this amazing property, which could range all the way from various pressure and force transducers and strain gauges to polymeric 'sensory organs' for machines and robots.

/9716
CSO: 1841/50

UDC 541.123

CONTINUOUS DISTILLATION OF VOLATILE COMPONENTS FROM POLYMER PRODUCTS (POLYESTERS)

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 8, Aug 86 (manuscript received 7 Mar 85) pp 1802-1806

[Article by K. V. Retyukin, A. V. Reusov and Ye. M. Ryzhov]

[Abstract] A study is made of the possibility of producing polymer products with high boiling point by continuous distillation of volatile components under a vacuum with simultaneous bubbling of inert gas. Equations are derived for determination of the basic dimensions of the apparatus and parameters of the process required to produce polymer products of the necessary quality. The mathematical model developed can be used to determine the required dimensions and the parameters to produce a product with a boiling point of 260-270°C. Figures 2; references 8 (Russian).

6508/9716
CSO: 1841/13

UDC 674.4

FIBROUS-POROUS REACTIVE MATERIALS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 8, Aug 86 (manuscript received 6 Jan 86) pp 1841-1845

[Article by S. V. Burinskiy, S. P. Aleksandrov and T. P. Stepanova, Leningrad Textile and Light Industry Institute, imeni S. M. Kirov]

[Abstract] In order to solve the problem of practical utilization of fibrous and sorbents, a hydrophilic polymer binder such as polyvinyl-formal was used to give the adsorbents the shape of a filter permeable to liquids and gases but also having significant strength. The chemical activity of such materials is determined primarily by that of the reactive fiber filler. The production of the fibrous-porous material consists of several stages: Mechanical foaming of a mixture consisting of an aqueous solution of polyvinyl alcohol, a surfactant and formalin, mixing of cation exchange fibers with the foamed mass, condensation to form the structure of the polyvinyl alcohol, and washing and drying of

the porous fiber reactive material. A series of experiments was performed to determine the influence of fiber content on the physical and chemical properties of the material, with fiber content varying from 30 to 80%. The maximum content of fiber filler producing usable products was found to be over 80%. However, the elasticity of such materials drops sharply, as does the degree of bonding of the fibers in the material, making materials with very high fiber content useful for gas phase sorption. In the dry state, the materials can be easily cut, and have a high modulus of elasticity, with relative deformation not over 3-5%. Varying the fiber content produces materials with a broad spectrum of physical and chemical, deformation and strength properties. Figures 3; references 6: 4 Russian, 2 Western.

6508/9716
CSO: 1841/13

UDC 678.746.22:539.411.5

IMPACT-RESISTANT POLYSTYRENE WITH HIGH ATMOSPHERIC AND COLD RESISTANCE

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 8, Aug 86 (manuscript received 6 Feb 85) pp 1846-1849

[Article by G. D. Ballova, V. G. Rupytsev, K. A. Vylegzhanina, N. Ya. Shmakalova and M. G. Rozhavskiy, Okhtinsk Scientific-Production Association "Plastpolimer"]

[Abstract] Results are presented from studies on the synthesis and investigation of the properties of impact-resistant polystyrene based on siloxane elastomers, facilitating an increase in weather resistance, cold resistance and wear resistance of the product. The polystyrene was synthesized by a block suspension method using elastomers containing small quantities of vinyl groups in the side chains. Benzoyl peroxide initiator produced products with qualities superior to azoisobutyric acid dinitrile initiator. Increasing the content of siloxane elastomer increased impact toughness of the product. Accelerated aging tests indicated no changes in impact toughness after thermal aging. Light aging did decrease impact toughness by 25-30%. Comparable testing of polystyrene containing 5-7% butadiene rubber produced a 90% decrease in impact toughness. Figure 1; references 10: 5 Russian, 5 Western.

6508/9716
CSO: 1841/13

UDC 541.15+541.127

ELEMENTARY REACTIONS DURING OXIDATION OF HYDROCARBONS IN LIQUID PHASE. POSSIBILITIES OF RADIATION CHEMISTRY

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: KHIMIYA Vol 27, No 4, Jul-Aug 86 (manuscript received 20 May 1985) pp 352-361

[Article by V. V. Sarayeva, Laboratory of Radiation Chemistry]

[Abstract] A review article of 44 references examining the reactions occurring during radiative-chemical oxidation of hydrocarbons at low (-78-25°C) and intermediate (up to 100°C) temperatures. Methods studied include irradiation in combination with electron paramagnetic resonance, pulse radialysis with optical registration, oxidation processes in a non-chain region and in regions of unbranched chains. Reactions were in the liquid phase. Reaction rate constants of alkyl-free radicals with oxygen and rate constants of bimolecular destruction of peroxide radicals in various solvents are given. Activation energy values for these elementary oxidation reactions are reported. The effect of temperature, oxygen concentration and radiation dose rates on product yields is presented graphically for various compounds and conditions. The reported completed studies reveal new routes for the oxidation process. Figures 5; references 44: 32 Russian, 12 Western.

12886/9716
CSO: 1841/10

UDC 621.373.826

LASER-RADICAL REACTIONS OF FLUOROORGANIC COMPOUNDS. SYNTHESIS OF TRIFLUOROMETHANE

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: KHIMIYA Vol 27, No 4, Jul-Aug 86 (manuscript received 31 July 1985) pp 372-375

[Article by F. N. Putilin, I. M. Turovets and Yu. Ya. Kuzyakov, Department of Physical Chemistry]

[Abstract] A laser-radical reaction of trifluoromethyl iodide (> 99% purity) with hydrogen was studied to determine optimum conditions for synthesis of trifluoromethane using a CO_2 laser with n=10 pulses. To break the C-I bond

but to minimize carbene CF_2'', the reaction of $CF_3I + H_2$ at $P_{o\ CF_3I}$ = 1.8 mm Hg, P_{H_2} = 0.6-30 mm Hg, was carried out at $\vec{\Phi}$ = 1.5 joule/cm^2 to yield the products CF_3H and C_2F_6. The effect of partial pressures and total pressure of the mixture of reactants was studied to establish optimum condition and yield of CF_3H. In the absence of H_2, CF_3I is dissociated 96%. As P_{H_2} increased to 30 mm Hg, CF_3I drops to 35%. CF_3H yield is a maximum of 34% at P_{H_2} = 8-12 mm Hg. The optimum partial pressure ratio is $P_{H_2}/P_{o\ CF_3I}$ = 10 for maximum CF_3H yield. The yield of CF_3H can be increased to 40% with 66% conversion of CF_3I by increasing the pulse number of irradiation. Experiments were also made at $P_{o\ CF_3I}$ = 1, 1.5 and 4 mm Hg (initial pressures). The yield of CF_3H rises with an increase of total pressure of the reactant mixture. The relationship of the ratio of the partial pressures of products (CF_3H to C_2H_6) with the partial pressure $P_{o\ CF_3I}$ at $P_{H_2}/P_{o\ CF_3I}$ = 5, 10 and 20 was examined. For the selected experimental condition, it was not practical to increase $P_{o\ CF_3I}$ more than 4 and the total pressure more than 100 mm Hg. It is possible to carry out the reaction with a greater % conversion of CF_3I at a ratio of partial pressures of products $P_{CF_3H}/P_{C_2H_6} > 6$. The yields of CF_3H obtained by the laser-radical reaction are higher than those reported previously by other methods. Figures 3; references 6: 3 Russian, 3 Western.

12886/9716
CSO: 1841/10

UDC 546.214+535.211

ARRHENIUS PARAMETERS FOR THERMAL DECOMPOSITION OF OZONE INITIATED BY INFRARED LASER PULSES

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 60, No 8, Aug 86 (manuscript received 21 Jun 85) pp 2050-2053

[Article by B. S. Lunin, O.V. Kuricheva and Yu.N. Zhitnev, Chemical Faculty, Moscow State University imeni M.V. Lomonosov]

[Abstract] A mathematical analysis was conducted on experimental data obtained in thermal decomposition of ozone by infrared laser pulses at 650 to 850 K. The study included assessment of nonstationary processes of mass and heat transfer in the system, and determination of the pre-exponential factor in the expression of the rate constant for the reaction. Accepting an energy of activation of 23 kcal/mole, the following equation was derived for the rate constant (in L/mole x sec): $k_1 = (4.4 \pm 0.9) \times 10^{11} \exp(-23{,}000/RT)$. The pre-exponential factor was quite close to those previously reported in other studies. The approach utilized in this study appears to be suitable for investigating transformation kinetics of unstable compounds at high temperatures. Figures 2; references 15: 8 Russian, 7 Western.

12172/9716
CSO: 1841/21

UDC 628.339.085

RADIATIVE TREATMENT OF BIOLOGICALLY PURIFIED DISCHARGE WATERS FOR THEIR UTILIZATION IN TECHNICAL WATER SUPPLY FOR INDUSTRIAL PLANTS

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNOLOGIYA in Russian Vol 29, No 6, Jun 86 (manuscript received 20 Mar 1985) pp 62-67

[Article by Ye. P. Petryayev, V. I. Vlasova, A. A. Sosnovskaya and N. N. Subbotina, Department of Radiation Chemistry and Chemical Technology, Belorussian State University im. V. I. Lenin]

[Abstract] Process for radiative pretreatment of biologically-purified water discharges from the cities of Novopolotsk (500 gR), Minsk (600 gR), and Gai (300 gR) was studied. After radiative treatment with 300-600 gR doses, the water was suitable for use in cooling return water supplies for industrial businesses. The water discharges were a mixture of household and industrial effluents (40-60%). The effect of absorbed doses of gamma rays of ^{137}Cs (dose rate 0.5 gR/sec) and conditions of treatment of the discharge waters on the degree of purification was studied. Detailed general and bacteriological properties of the water before and after treatment with 300-600 gR doses and the requirements of quality for the cooling water are given. Optimum doses for decreasing the chemical O_2 demand and the biological O_2 demand to the norm for return water supplies are 300-600 gR at which purification reaches 45-70% for COD and 60-98% for BOD. Technical-economic estimation of the readiative method for pretreatment of discharge waters indicated that for treatment of 17,000 m^3/day or 5.7 million m^3/yr. with 500 gR doses requires a radiation power of 100 kW. Radiative treatment is recommended as a process for industrial regeneration of clean water from polluted sources. Figures 4; references: 7 Russian.

12886/9716
CSO: 1841/5

PAPER-MAKING MACHINE-4 PRODUCTION AT KOMI PLANT GIFT FROM PAPER WORKERS TO 27th CONGRESS OF CPSU

Moscow LESNAYA NOV in Russian No 2, Feb 86 p 16

[Article by V. Malyshev, Paper Making-Machine-4 brigade foreman, Syktyvkar Industrial Forestry Complex, Komi ASSR]

[Abstract] Paper production at the Syktyvkar Industrial Forestry Complex increased significantly with the introduction in 1981 of a new model of a No. 4 paper-making machine. After the addition of another such machine the annual production was now increased to 360,000 tons of printing paper, which is currently being supplied to 300 cities in the USSR. The use of the new machine has significantly reduced the need for raw resources and improved the cost-effectiveness of the entire paper-making process. This is hailed as a fitting gift for the 27th Congress of the CPSU.

12172/9716
CSO: 1841/421

END

END OF FICHE DATE FILMED

MARCH 3, 1987